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Syngas or synthesis gas is a mixture of gases consisting mainly of CO, CO₂ and H₂. It can be converted to liquid or gaseous biofuels through chemical or biological processes. Conventional catalytic processes like Fischer-Tropsch present high operational costs as they require high temperatures and pressures and high supply cost for the catalysts. One promising alternative is the microbial fermentation processes which take place under mild conditions that entail low energy and infrastructure costs. In addition, the microbes are relatively cheap and they do not demand a fixed H₂/CO ratio as the chemical catalysts do.

However syngas bioconversion to biofuels faces important challenges that should be circumvented before the process is scaled up. The main bottlenecks are the mass transfer of sparingly soluble syngas compounds to the water based microbial cultures and the relatively low growth rate of the microbes that leads to insignificant productivity rates. Towards this direction we designed lab scale experiments with trickle bed reactors and enriched anaerobic sludge as their inoculum. The use of mixed microbial consortia renders strictly sterile operation unnecessary and enhances the adaptability of the microbial community to sudden changes of the operational conditions.

The goal of this study is to assess several operational parameters such as liquid recirculation rate, hydraulic retention time and gas flow with reference to the methane productivity, the substrate conversion yield and the composition of the gas exiting the reactor as well as shedding more light to the phenomena occurring in mixed microbial consortia syngas biomethanation.